Lets discuss Quarkonium Measurement at (future) STAR

(Performance, PID, Trigger)

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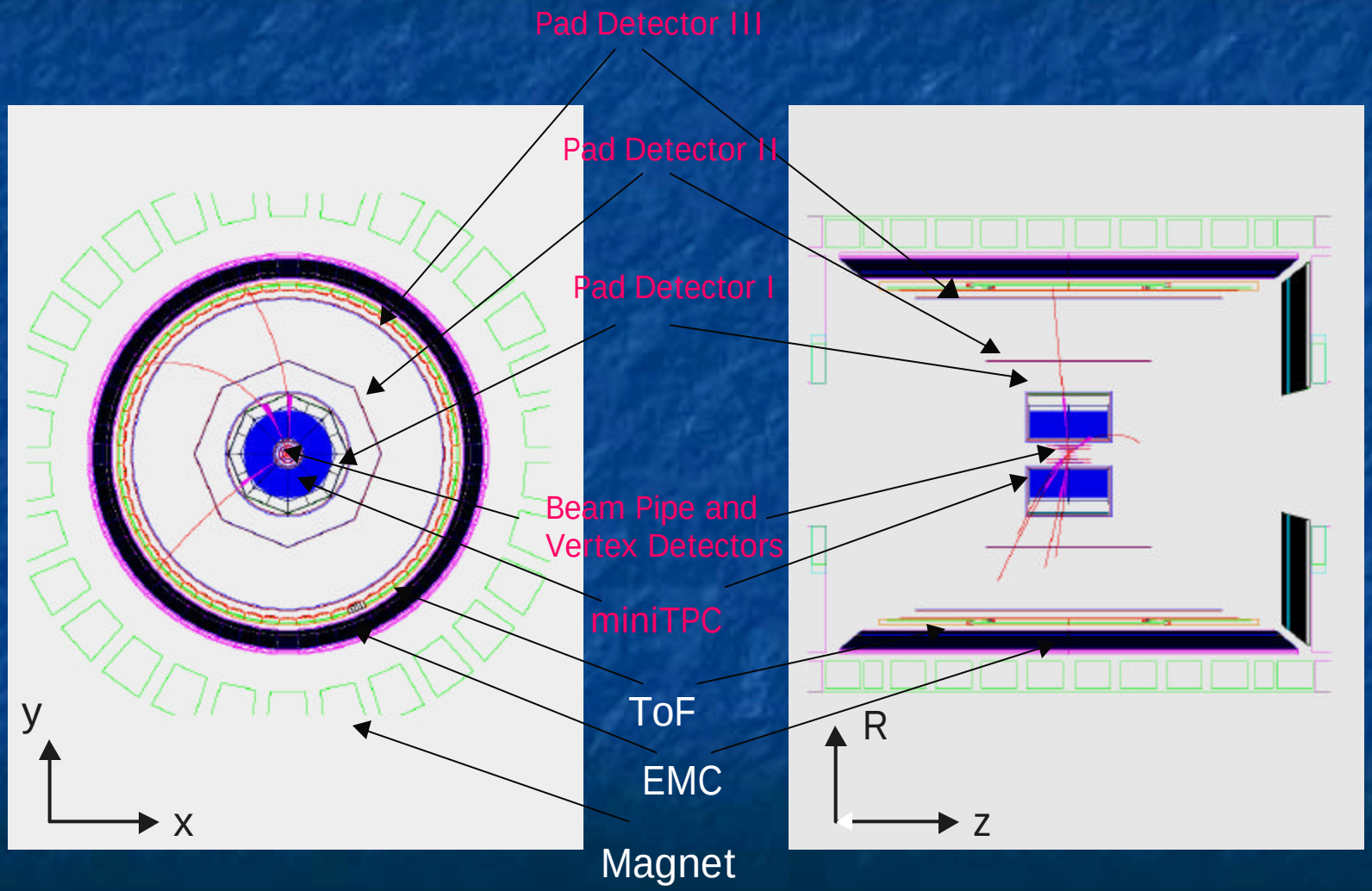
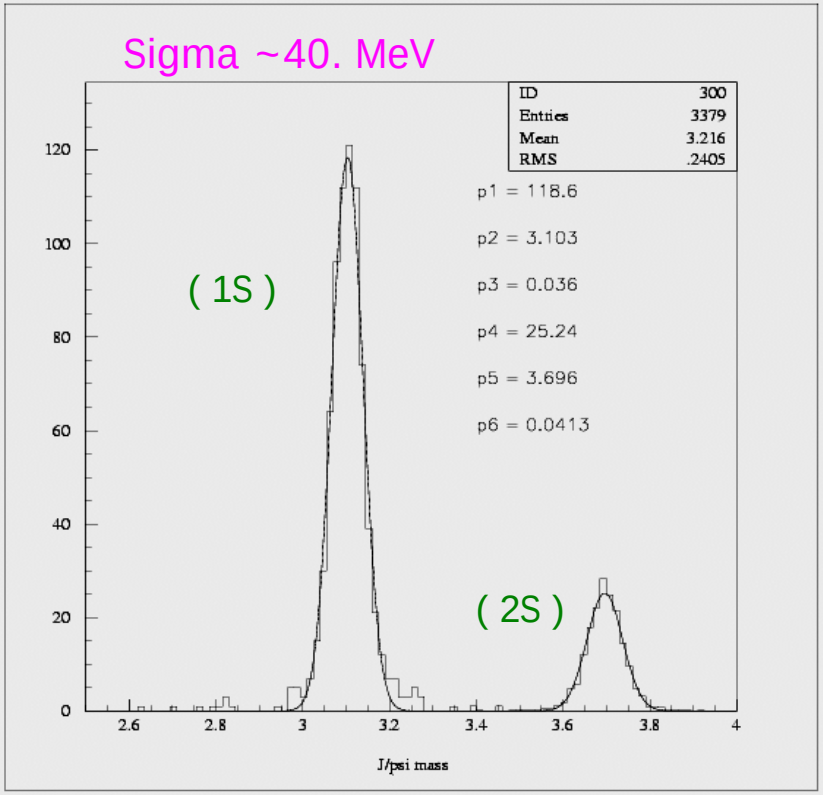
STAR tracking, proposed variant

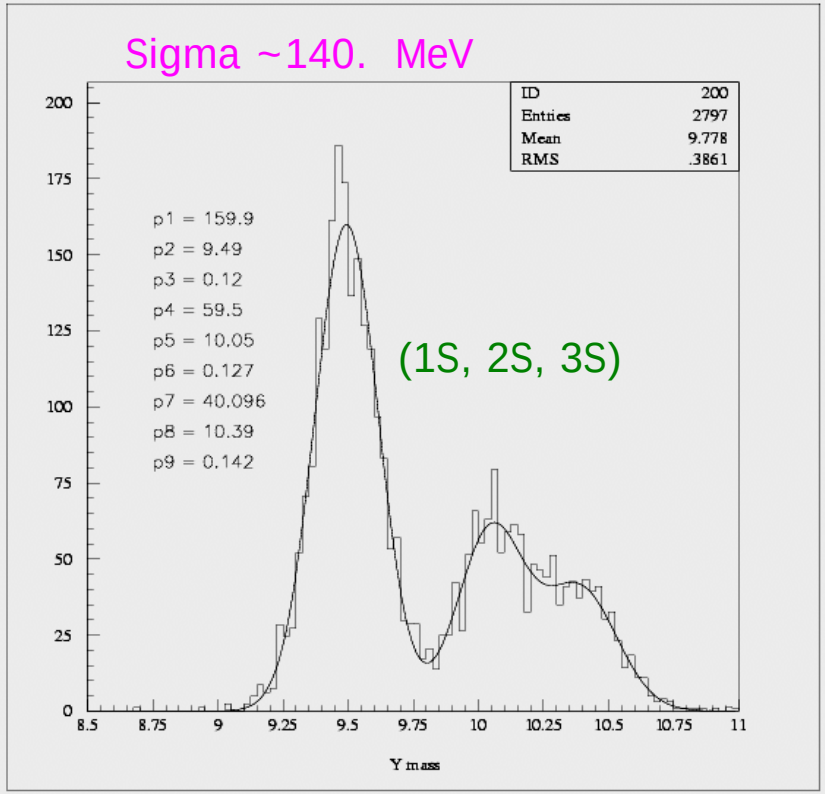


J/? and ? -→ e+e- reconstruction performance

Sigma ~40. MeV



Sigma ~140. MeV



It needs PID, Rate, Trigger;

(increase MF !?)

e/h PID in EMC for 90% electron efficiency

Particle momentum (GeV/c)	Hadron suppression factor (optimistic)
0.5	5.
1.0	30.
2.0	100.
5.0	400.

in real applications of the calorimeter where electrons associated with the desired process will be typically far more abundant at lower P_T than at high P_T. In this situation, lower electron efficiencies can be tolerated exactly where they are needed to achieve higher hadron suppression.

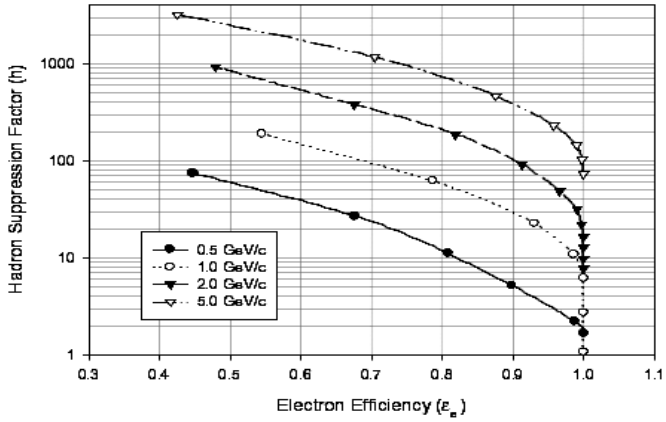
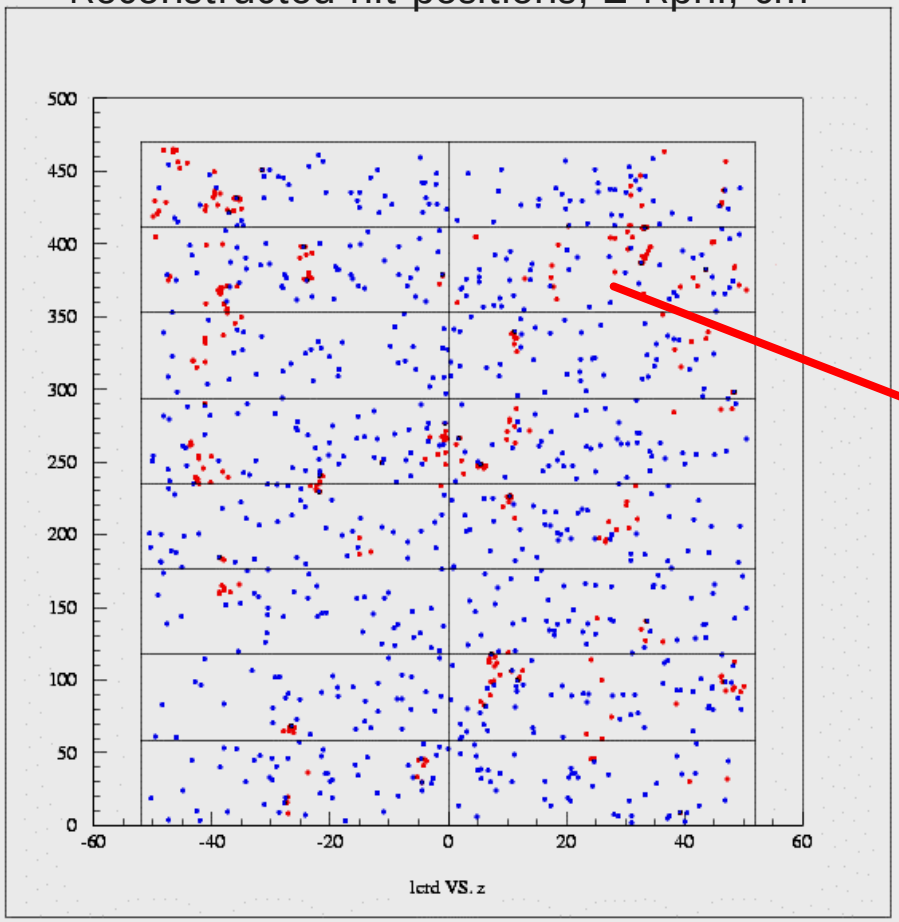


Figure 15. Final, best current estimate, hadron suppression factors based on experimental results for the dominant hadron suppression which follows from E/p combined with what we have argued are robust simulations of the correlation corrected hadron suppression provided by the shower maximum detector and the pre shower detector.

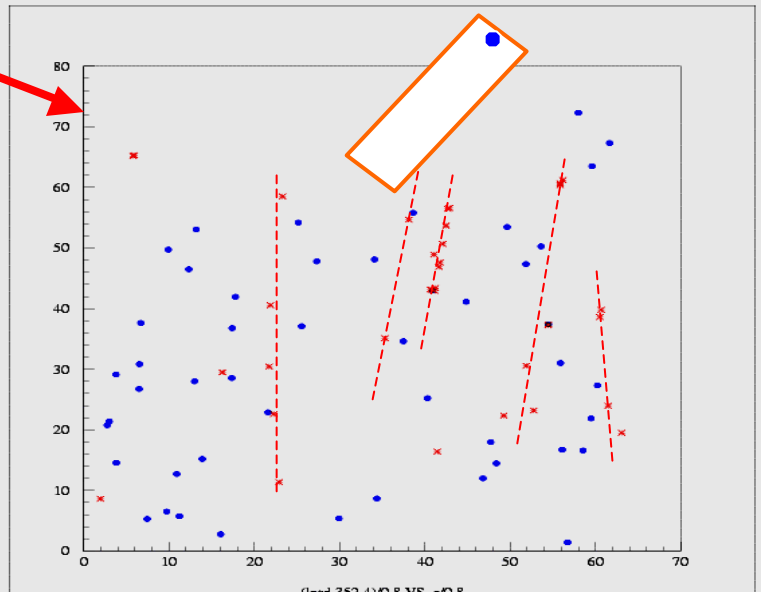
Pad Detector I response simulation, and e+/- PID

Central HIJING event, “full scale” simulation,
Reconstructed hit positions, Z-Rphi, cm



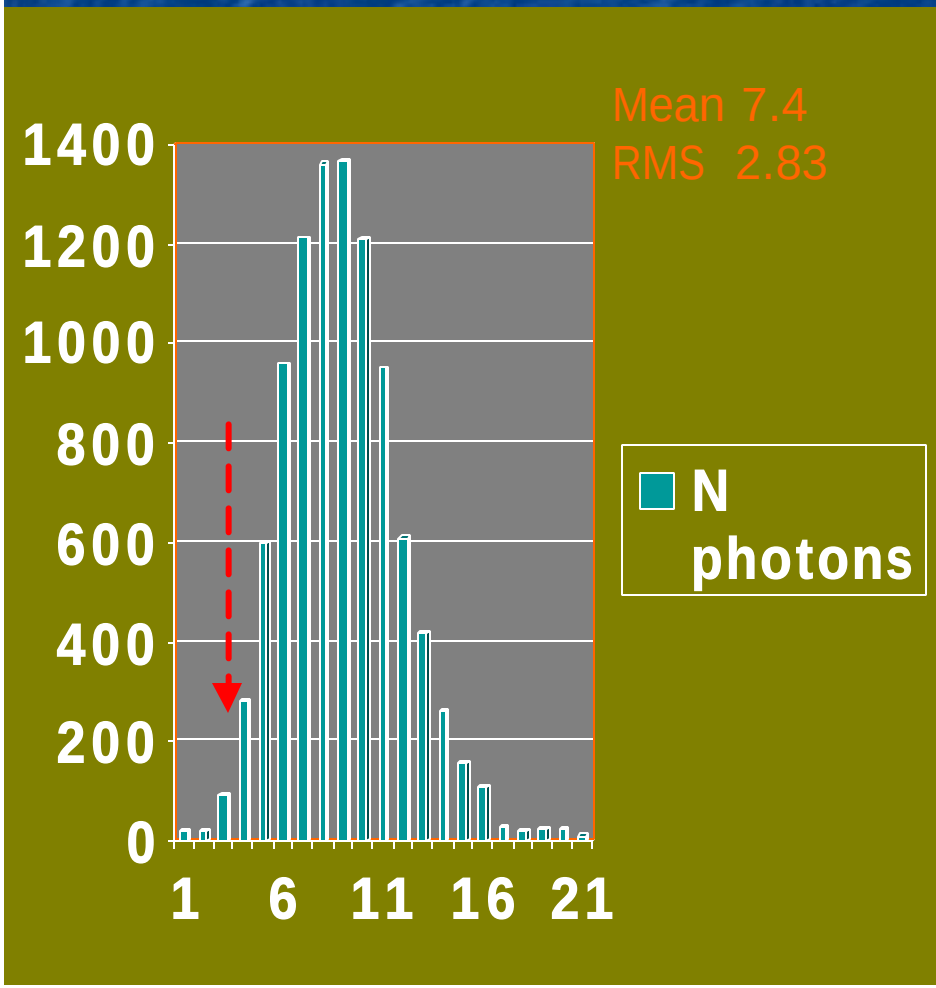
MIP – blue points
UV – red points

820 MIP hits → 4100 act. Pads
790 UV hits → 1185 act. Pads
Pad size = 0.6x0.6 cm2
Number of pads = 77824
Occupancy = 6.7%



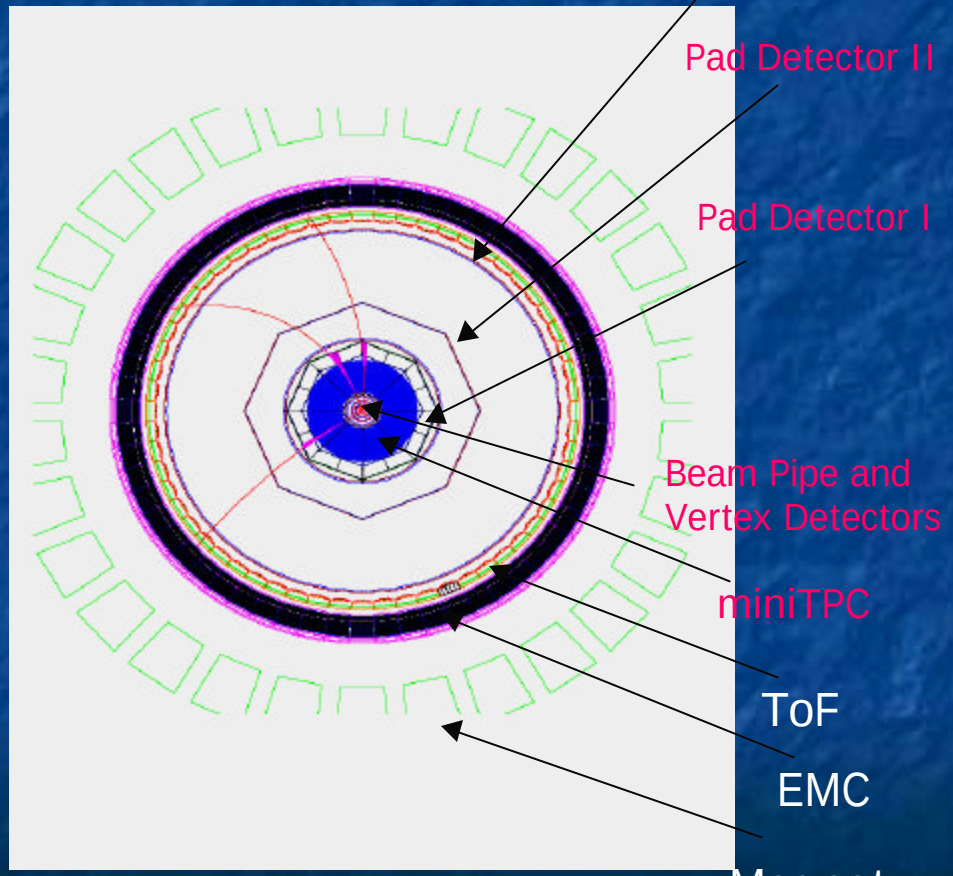
HBD performance (preliminary)

Number of reconstructed UV photons/track
(9 or more TPC hits)



- For “central” HIJING events:
  - the lepton PID efficiency (all found tracks in TPC) – 90.8%.
  - The number of wrong hadron identifications – 1.5 tracks/event.

STAR tracking, proposed variant.
Pad Detectors, high Pt particles reconstruction and Trigger



- three Pad Detectors on Radius: 75., 110. and 200. cm
- microPattern gas detector technology: fast response, needed space resolution, any pad shape, not expensive.
- Pad Detector III – CTB role, “hit” in a front of Aerogel Ch. Det, ToF, EMC.
- High Pt Trigger.
- “fast” – “slow” combination.

High Pt Trigger (or can we work without TPC data ?!)

- Data only from Pad Detectors (and partly from SVT)
- Primary Vertex reconstruction
- Track finding in (R,Z) and (R,Phi)
  Pt ~ d(R)/d(Phi)
- Helix parameters
- SVT crossing, check hits (refit can be done)
- “matching” procedure with EMC, Gas Ch. Detector (and may be more) to get PID “on-line”
- “mass resolution” – 20% worse (if primary Vertex and SVT data are in a fit)

“Last night result”:

-- for Pt threshold 3.5 GeV/c

-- 1 pion / event: 80% efficiency

-- 20 central HIJING events: 0 triggers were found (as should be)

What we can get with ToF, Gas Ch, Aerogel Ch, EMC.

Particle	Mass	ToF	Aerogel (1.015)	Gas (1.00044)
Pion	0.139	(0.6-1.8)	0.95	4.8
Kaon	0.494	(0.6-1.8)	2.9	16.3
Proton	0.938	(1.-2.9)	5.45	32.

limits of PID (for ToF)

or

threshold value for Ch. Det. (GeV/c).

dP (GeV/c)	PID
0.6 – 2.9	pi, K, p
2.9 – 4.8	(pi+K), p
4.8 – 5.45	pi, K, p
5.45 – 16.3	pi, (K+p)
16.3 – 32.	(pi+K), p

→ what about muons ?

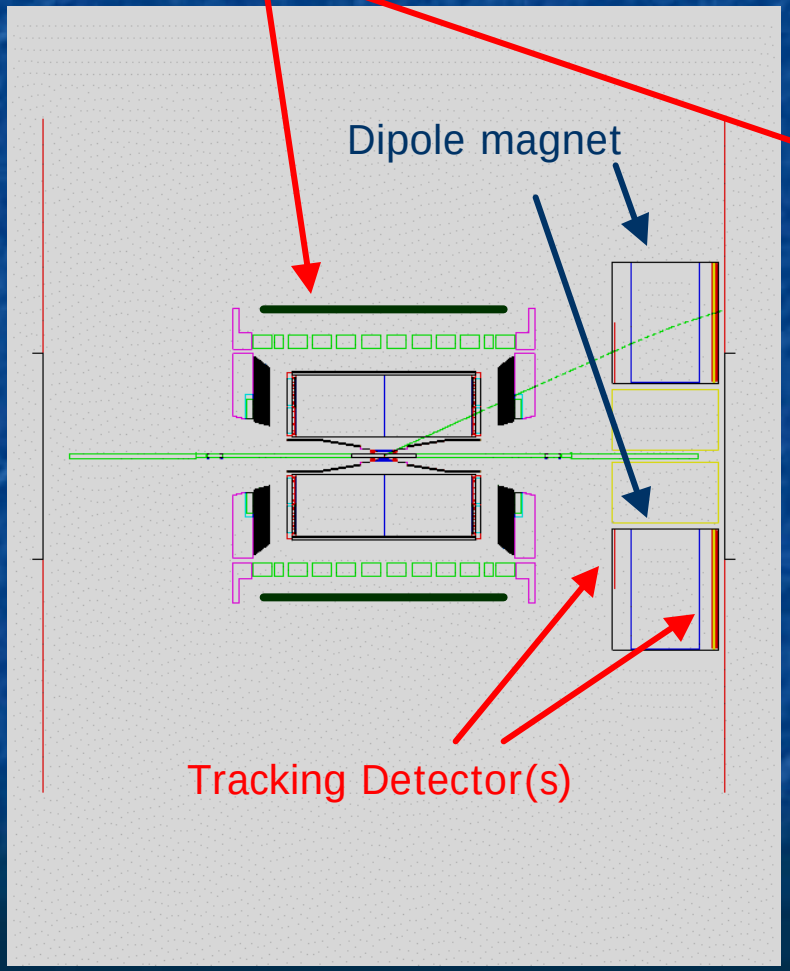
Second Aerogel Ch Det (n=1.005) --→ pi, K, p up to 9.5 GeV/c

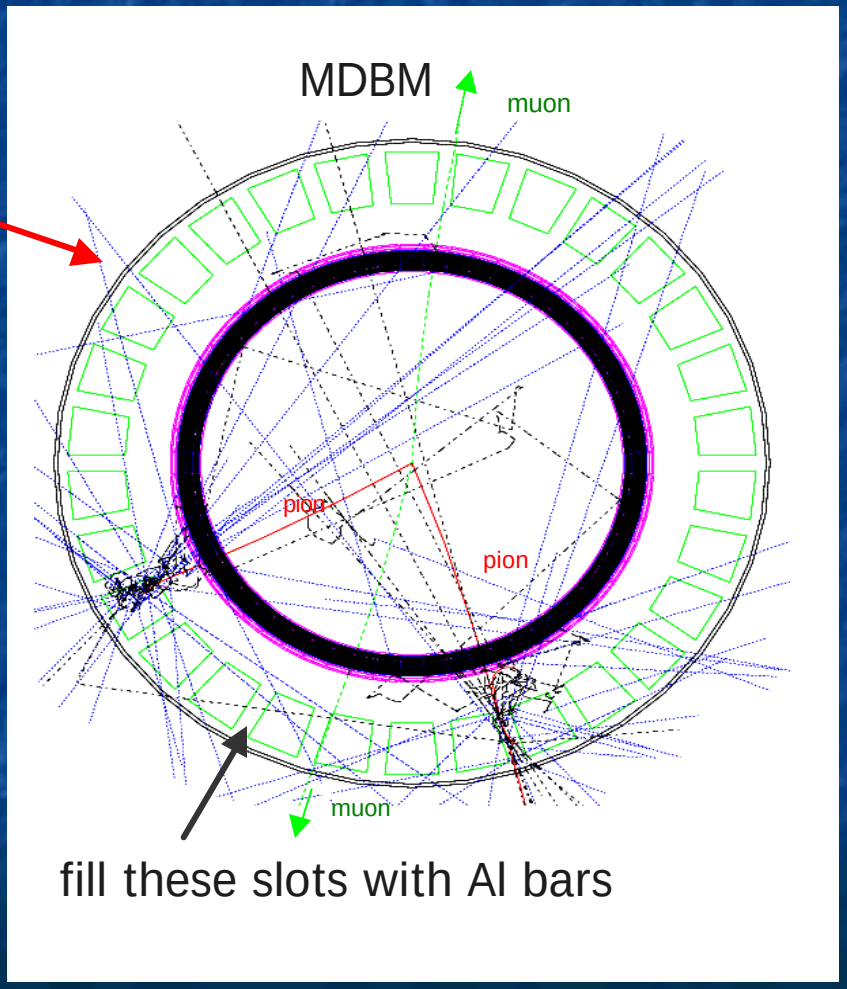
Muon identification approach

- Absorber (target) -→ spectrometer + PID
- Target --→ spectrometer --→ absorber ---→ spectrometer ---→ PID
- Main background: Pion -→ Muon decay

Muon detector at STAR

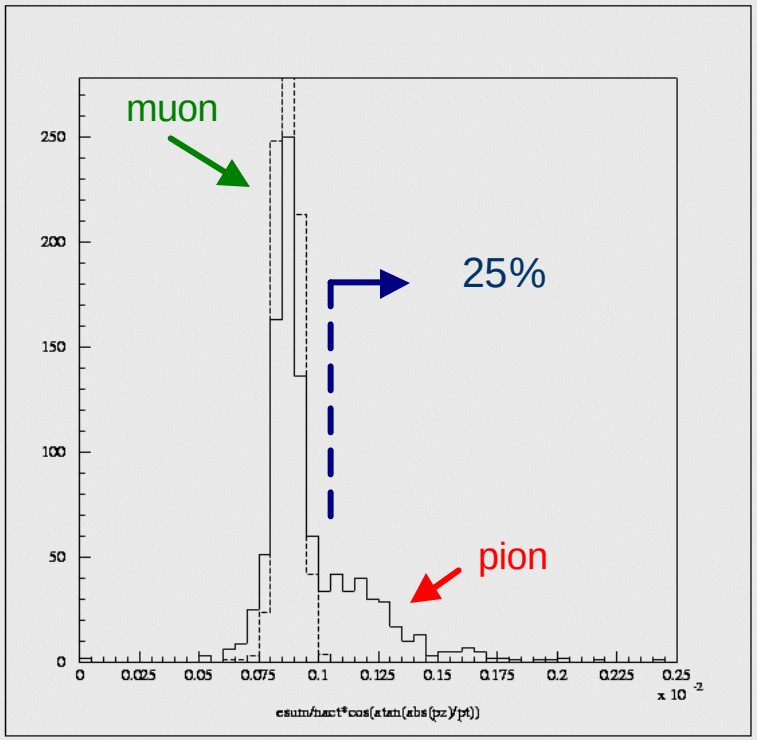
Tracking (muon) Detector behind Magnet (MDBM)





EMC response on pion, muon (2.5-3.5 GeV/c) and tracking (muon) Detector “behind Magnet”

EMC response / one sc.

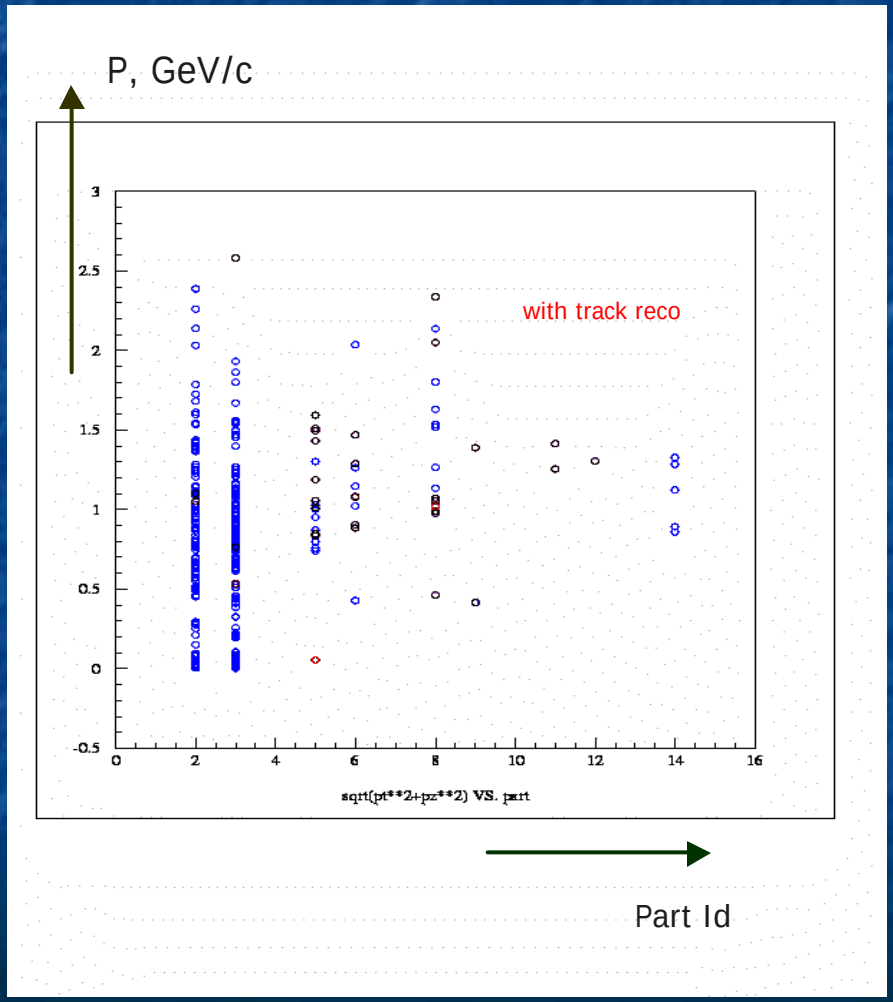


- MDBM response
- muons : 100%
- pions :

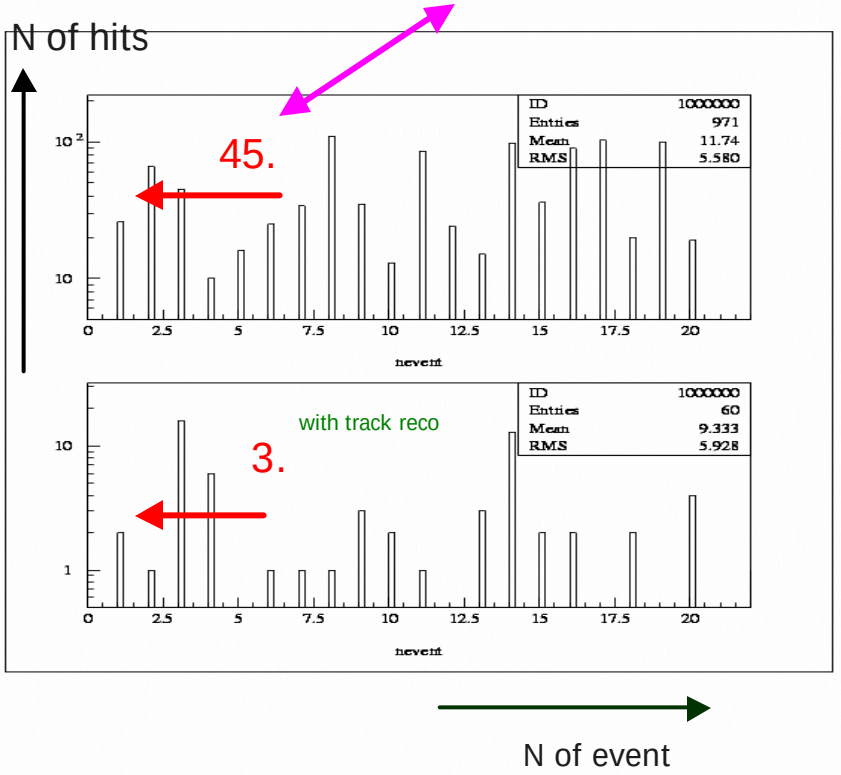
-- today magnet – 18% tracks have hits in MDBD

-- with Al bars – 6%

MDBM response on central HIJING events



without Al bars – 405 hits/event.



20 central HIJING events

“physics” ON

GEANT hits

J/? and ? ---> e+e- good quality measurements can be done at STAR.

Needed PID, Data Rate and Trigger can be provided with new tracking set-up

Acceptance can (should) be improved with an additional tracking in a front of End-Cap EMC

J/? and ? ----> μ+μ- in mid Rapidity !?

And “the same conditions” Open Charm measurements (special report(s))

J/? --→ e+e-